

LIST OF PORT JACKSON CHITONS COLLECTED BY DR. J. C. COX, WITH A
REVISION OF AUSTRALIAN ACANTHOCHITIDÆ.

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The following pages contain a part of the results of the study of a collection of the Chitons of Port Jackson, New South Wales, Australia, recently made by Dr. J. C. Cox, the well-known Australian conchologist. Dr. Cox, with great liberality, transmitted to the Academy a large number of specimens both dry and preserved in spirits, with the request that they be studied and reported on. I am therefore enabled to make a contribution toward an exact knowledge of the distribution of the Polyplacophora inhabiting the New South Wales coast, as well as to elucidate several important points relating to particular species and genera.

With the exception of a few records by Mr. E. A. Smith, of Port Jackson species collected by Coppinger,¹ and by Professor Haddon of those collected by the "Challenger,"² our knowledge of the Chiton fauna of the New South Wales coast is limited to the lists published by Mr. G. F. Angas³ many years ago. At that time, the morphology of Polyplacophora was very imperfectly understood; and consequently these admirable lists, which have been so helpful to subsequent conchologists in dealing with most families of mollusks, are almost useless in the study of Chitons, so many errors do they contain.

Angas, however, found some forms in Port Jackson which subsequent observers have not yet found, and among them several, such as *Microplax Grayi*, of exceptional interest to the general student on account of their peculiar and ill-understood features.

To direct the attention of local malacologists to these forms, if for no other reason, it is thought expedient to quote Angas' list of species, the modern equivalents of his names, so far as known to me, being given in another column.

¹ Zool. Coll. H. M. S. "Alert."

² Challenger Reports, Vol. XVII.

³ Proc. Zool. Soc. London, 1867, p. 221. and 1871, p. 97.

ANGAS' PORT JACKSON LIST.	MODERN EQUIVALENTS.
Lophyrus australis	= Ischnochiton australis Sowb.
“ concentricus	= Chiton jugosus Gld.
“ glaucus	? = Ischnochiton lentiginosus Sowb.
“ muricatus	= Chiton muricatus A. Ad.
“ jugosus	= “ Coxi Pils.
“ smaragdinus	= Ischnochiton smaragdinus Ang.
Lepidopleurus proteus	= (Ischnochiton divergens Reeve
“ longicymba) and fruticosus Gld.
“ ustulatus	= Ischnochiton Haddoni Pils.
“ antiquus	? = Callistochiton antiquus Rve.
Tonicia Carpenteri Ang.	= Tonicia Carpenteri Ang.
Leptochiton versicolor	= Callochiton platessa Gld.
Onithochiton Incei	= Onithochiton
“ rugulosus	= “
Chiton piceus	= Liolophura Gaimardi Blv.
Chaetopleura rugosa	
Lorica cimolia	= Lorica volvox Rve.
“ Angasi	= Loricella Angasi H. Ad.
Plaxiphora petholata	= Plaxiphora petholata Sowb.
Acanthochites costatus	= A. (Loboplax) costatus H. Ad.
“ scutiger	= and Ang.
“ carinatus	? = { A. (Meturoplax) retrojectus
Microplax Grayi	} Pils. or A. granostriatus Pils.
Cryptoplax striatus	? = A. Coxi Pils.
	= Chorioplax Grayi H. Ad. & Ang.
	= Cryptoplax striatus Lam.

Of the twenty-four species listed by Angas, I have not seen *Lepidopleurus ustulatus*,⁴ *Tonicia Carpenteri*, *Chaetopleura rugosa* or *Microplax Grayi*. The type of *T. Carpenteri* was examined by Dr. Carpenter who considered it a good species. It probably belongs to the section *Lucilina*. Angas' *Chaetopleura rugosa* may possibly be a young *Plaxiphora*, but it is with hesitation I hazard any conjecture upon it. A note upon *Microplax Grayi* will be found in *The Nautilus* for April, 1894, p. 139. The other species of Angas' list I have identified with a considerable degree of certainty, having numerous specimens of all of them before me, as well as some additional forms lately discovered. The species collected by Dr. Cox are as follows:—

⁴ *Ischnochiton ustulatus* Rve. occurs abundantly in South Australia, but nothing I have seen from Port Jackson corresponds to this species.

Family ISCHNOCHITONIDÆ.

Genus CALLOCHITON Gray.

Callochiton platessa Gould.

Port Jackson. This is the *Leptochiton versicolor* Ad., of Angus' list. It is a lovely shell of the most brilliant orange-red color. A larger, dark-brown species allied to this, occurs on the Tasmanian coast, *Callochiton* (*Trachyradisia*) *inornatus* Ten.-Woods.

Genus ISCHNOCHITON Gray.

The general arrangement of the species of this genus is far from satisfactory. Former classifications have been founded too exclusively upon the girdle scales. The Australian species fall into five natural groups, or sections, which may be defined as follows:—

1. *Ischnochiton* s. str: type *longicymba* Q. & G.

Intermediate valves having 1-1 slits; lateral areas radially sculptured, central areas finely granulated in quincunx, or longitudinally lirate at the sides, with "V" sculpture along the ridge. Girdle scales subequal, striated.

2. *Stenochiton*: type *juloides* A. & A.

Animal much elongated: intermediate valves having several slits on each side.

3. *Heterozona*: type *curiosa* Cpr.

Like *Ischnochiton* (sensu stricto), but girdle scales minute and large, intermingled.

4. *Haploplax* nov.: type *smaragdinus* Aug.

Intermediate valves having 1-1 slits; entire surface smooth except for minute granulation; girdle scales convex, smooth.

5. *Ischnoradisia*: type *australis* Sowb.

Shell not unusually elongated; intermediate valves with several side-slits, sculpture coarse; girdle scales very convex, not striated.

Ischnochiton Haddoni Pilsbry.

Very abundant at Port Jackson and Port Hacking. This should be compared with the type of *Chiton crispus* Reeve, Conch. Icon. pl. 19, fig. 120, a species I have not seen. Also with *C. pallidus* Reeve, l. c. pl. 16, fig. 92.

It is certain that this is not *Chiton longicymba* Blainville,

nor is the New Zealand species described by Quoy & Gaimard the same as that of de Blainville.

Ischnochiton fruticosus Gld.

Abundant at Port Jackson, with the next species. This form is distinguished from *I. divergens* by its very much smaller girdle scales. In *fruticosus* the individual scales measure in width .25 mm., or four to a millimeter. In *divergens* they measure .40, or only two and a half to the millimeter. The difference is perfectly obvious to the naked eye.

This species and the next seem to have been included by Angas under the name *Lepidopleurus proteus*. I believe *Callistochiton Coppingeri* Smith to be the young of this species.

Ischnochiton divergens Reeve.

Port Jackson and Port Hacking (Cox). Reeve's *Ch. proteus*, described from Newcastle, is a synonym.

Ischnochiton (Ischnoradsia) australis Sowb.

Port Jackson (Cox).

Ischnochiton (Haploplax) smaragdinus Angas.

Port Jackson (Cox). This species varies wonderfully in coloration. The following patterns being represented in the lot before me: (a) white or pale olive, the front and hind valves black; sometimes the fourth, fifth and seventh valves marked boldly with black. (b) Pale olive, flecked closely with olive, head and tail valves black. (c) Sky-blue, closely reticulated with olive, and in places marked with white. (d) Rich brown, speckled with olivaceous, and marked with white on valves i, iv, viii. The details are thus endlessly varied. Mr. E. A. Smith has kindly verified my determination by a comparison with Angas type of *smaragdinus*.

I. smaragdinus picturatus var. nov.

Color-scheme consisting of a wide dorsal stripe of lilac, dark blue, ochre or some combination of these or other hues; the stripe bordered with brownish, this border spreading forward on valve i, and spreading over most of valves ii and vi. Remainder of the side-slopes light and variegated. Girdle irregularly tessellated.

This seems so well defined a pattern of coloring that I venture to give it a name. Many specimens are before me from Port Jackson.

Ischnochiton (*Haploplax*) *lentiginosus* Sowb.

Shell rather thin, oval, moderately elevated, carinated, the sideslopes straight. Surface smooth except for slight radial riblets on the lateral areas. Ground-color orange, orange-brown, or even with an olive suffusion, coarsely spotted throughout with bright blue; the girdle olive-green, unicolored or with dusky bars.

The intermediate valves are slightly concave behind, the beaks slightly projecting and interrupting the curve. Lateral areas slightly raised, marked by 4 to 6 weak, low radial riblets, obsolete in some specimens. Central areas having slight growth lines, but otherwise unsculptured except for the usual microscopic granulation of the whole surface. End valves showing traces of radial riblets toward the periphery. Posterior valve having the rather blunt mucro at the summit of the straight posterior slope, and in front of the middle.

Interior roseate in the cavity, olivaceous behind the valve-callus, the sutural and insertion-plates blue-white. Sutural-laminae short, projecting less than half the length of a valve, separated by a rather narrow, hardly squared, sinus. Anterior valve having 11, intermediate valves 1-1, posterior 13 slits; teeth sharp, normal.

Girdle clothed with densely imbricating convex, polished scales, which generally show a very minute striation under the compound microscope. The scales measure: width .28, alt. about .22 mm.; the width of a scale is therefore contained about $3\frac{1}{2}$ times in a millimeter.

Length 19, breadth 10 mm.; divergence about 115° .

This species was described from Newcastle, N. S. Wales. It has since been confused with *I. cyaneopunctatus* Krauss, a very similar species from the Cape; and its Australian habitat has been doubted. The rediscovery of the species in Australia (Port Hacking, N. S. Wales) by Dr. Cox is therefore of unusual interest.

In some specimens there is a narrow whitish stripe on the ridge of valves iii, iv, v, vii and viii; and in some the blue spots become enlarged and diluted on valve iv, forming a pale blue or whitish variegation.

This cannot be *Chiton clypeus* Blainv. (Dict. Sci. Nat., xxxvi, p. 540), which is also described as blue-spotted.

Genus *CALLISTOCHITON* Cpr.

Callistochiton antiquus Reeve.

Port Jackson (Cox). Readily recognized by the very strong

sculpture of the valves, which is not paralleled by any other small Chiton of Australian waters.

Another species referred to this genus, *Callistochiton Coppingeri* E. A. Smith, has been described from Port Jackson. I have not seen the type, but I believe it to be a young, roughly sculptured *Ischnochiton fruticosus* Gld.

Family MOPALIIDÆ.

Genus PLAXIPHORA Gray.

Plaxiphora petholata Sowb.

Abundant and typical at Port Jackson and Port Hacking. At the latter locality some specimens occurred having the exterior colored like *P. glauca* Quoy (Man. Conch., XIV, pl. 68, fig. 72), and the inside pink and white, slightly clouded with blue. I have not seen specimens of the true *P. glauca*, which is described as smooth outside. The valves of *P. petholata* are always finely corrugated.

Family ACANTHOCHITIDÆ.

But one genus of this family, *Acanthochites*, has been found to have representatives in Australian waters. This genus is nearly world-wide in distribution in tropical and temperate seas. The other genera of the family are local in distribution, and contain very few species.

Genus ACANTHOCHITES Risso.

The genus *Acanthochites* is one of the most difficult groups of Chitons, partly on account of the insufficiency of the published descriptions of species, partly because the specific characters are not easy to see in the creatures themselves, especially if the external features only of the animal are studied.

When the valves are removed from the girdle, a number of excellent distinguishing characters are seen, enabling us to reach more satisfactory conclusions in most cases.

The characters to be especially observed are :—

1. General form, etc., features of girdle, its tufts, and presence or absence of a marginal fringe of longer spicules.

2. General features and coloring of valves; *shape of their posterior (sutured) margins*, which may be either concave, or convex and strongly imbricating.

3. Degree of *differentiation of dorsal areas*, which may be either raised at the edges, or continuous with the side areas, and *either transversely or longitudinally striated*. Sculpture of side-areas, and *shape of the pustules, which may be either convex or concave*.

The preceding features may be observed without disarticulating the specimen; the following require its dissection, which is easy enough after soaking it in warm water.

4. Shape of *tegmentum of tail valve*, proportion of its breadth to length, and position of mucro.

5. Shape of *posterior insertion-plate of tail valve*, which may be either regularly rounded or angular. Number of slits.

6. Length of front slope of *tegmentum of head valve* as compared with length from apex to edge of front teeth of same.

The last mentioned character is a good index to the degree of immersion of the valves in the girdle. Of course, any of these characters is subject to individual variation, but if a description is prepared noticing them all, it is extremely likely to contain something which will lead to the identification of a given specimen. In my account of this genus in the Manual of Conchology, insufficient attention was given to the features of the tail valve.

The following species referable to the family *Acanthochitidae* have been described from Australia:

- 1825.—*Chiton polychetus* Blainville, Dict. Sci. Nat., XXXVI, p. 552, New Holland.
- 1825.—*Chiton rosens* Blainville, *t. c.*, p. 553, New Holland.
- 1825.— “ *Suenrii* “ “ “ King George Sound.
- 1825.— “ *scaber* “ “ “ Seas of New Holland.
- 1861.—*Cryptoplax (Notoplax) speciosa* H. Adams, Proc. Zool. Soc. Lond., p. 385, Tasmania (Cuming); Flinder's I. (Miligan).
- 1864.—*Hanleya variabilis* H. Adams & G. F. Angas, P. Z. S. p. 194. Yorke Peninsula (Angas).
- 1864.—*Acanthochites carinatus* H. Adams & G. F. Angas, P. Z. S. p. 194. Port Jackson (Angas).
- 1864.—*Acanthochites costatus* H. Adams & G. F. Angas, P. Z. S. p. 194. Port Jackson (Angas).
- 1865.—*Acanthochites scutigera* A. Ad. & Ree., Angas, P. Z. S. p. 188. Port Lincoln (Angas).
- 1882.—*Acanthochites tristis* Rochebrune, Bull. Soc. Philomath. Paris, 1881-1882, p. 194. New Holland (Dussumier).
- 1882.—*Acanthochites turgidus* Rochebrune *t. c.*, p. 194. New Holland (Peron & Lesueur).

- 1882.—*Acanthochites jucundus* Rochebrune, *t. c.*, p. 194. New Holland (Belligny).
 1884.—*Chiton (Acanthochiton) usbestoides* Cpr. MS., E. A. Smith, Zool. "Alert" p. 83. Port Molle (Copping).
 1894.—*Acanthochites (Meturoplax) retrojectus* Pilsbry, Nautilus, p. 107. Port Jackson (Cox).
 1894.—*Acanthochites gemostriatus* Pilsbry, Nautilus, p. 119. Port Jackson and Port Hacking (Cox).
 1894.—*Acanthochites Coxii* Pilsbry, Nautilus, p. 119. Port Jackson (Cox).
 1894.—*Acanthochites Matthewsii* Bednall & Pilsbry, Nautilus, p. 119, S. Australia (Matthews).

Of these seventeen species, the four described by de Blainville have not been recognized, and without an examination of the types they cannot, in my opinion, be really known. The three species described by Dr. Rochebrune will also prove difficult to identify, although *A. jucundus* will probably be recognized by its peculiar coloration. Most of these species of Blainville and Rochebrune were founded upon specimens collected in the early part of the century and no locality more exact than "New Holland" is stated. It must be remembered that even this vague geographical information is not to be considered conclusive. Some early voyagers have been known to get the localities of their shells mixed.

The remaining species are known to be Australian; but two of them, *H. carinatus* and *A. scutigera*, must be rejected; the first because the name is preoccupied by Risso (*Acanthochites carinatus* Risso, Hist. Nat. Eur. Mérid., IV, p. 169. 1826), the other because it is founded upon an incorrect identification.

We have, therefore, eight recognizable species of *Acanthochites* from this region, if we include "*Hanleya*" *variabilis* which is unknown to me autoptically. To this number, one more is herein added.

The Australian *Acanthochites* fall into four subgenera or sections, distinguished by the following characters:

- a.* Anterior valve having five strong radiating ribs, lobing the periphery of the tegmentum; tail valve with several slits.
Loboplax
aa. Anterior valve without radial ribs, the lower margin of the tegmentum not obviously lobed
b. Valve viii having the mucro posterior, its insertion-plate

2-slit, the posterior portion strongly directed forward .

Meturoplax

bb. Posterior insertion-plate of valve viii spreading backward or vertical; mucro not at the posterior extremity.

c. Valve viii with two slits, and a wide, shallow posterior sinus *Acanthochites*

cc. Valve viii with several slits *Notoplax*

KEY TO AUSTRALIAN SPECIES OF ACANTHOCHITES.

a. Anterior valve having five strong radiating ribs; insertion-plate of tail valve with more than two slits *costatus*

aa. Anterior valve not strongly ribbed.

b. Posterior insertion-plate of tail valve directed forward, two-slit.

c. Posterior margins of median valves convex (or straight by erosion); side areas of valves coarsely granulose, the dorsal areas smooth, not defined, not longitudinally striated. Size small *retrojectus*

bb. Posterior insertion-plate directed backward or vertical; mucro not at the posterior extremity.

c. Valve viii with two slits, a wide, shallow sinus between them.

d. Tegmentum of valve viii less than half as wide as those of the intermediate valves; dorsal areas smoother than sides, but not defined, not longitudinally striated; posterior margins of valves very convex, broadly reflexed within; tufts dense, silvery, asbestos-like . .

asbestosoides

dd. Tegmentum of valve viii more than half as wide as those of intermediate valves; dorsal areas longitudinally striated; posterior margins of valves i to vii not convex, generally concave.

e. Posterior margin of the insertion-plate of valve viii regularly convex, not bilobed; sides of valves with radially elongated convex pustules; interior and sutural-laminae roseate; tufts inconspicuous, hardly

- longer than the harsh, stiff pile of the girdle generally *Coxi*
- ee.* Posterior margin of insertion-plate of valve viii biangular; sides of valves with flat or concave pustules; tufts noticeably longer than the pile of the girdle.
- f.* Dorsal areas smooth, with delicate longitudinal striæ . . . *grauostriatus*
- ff.* Dorsal areas strongly, deeply striated longitudinally *Bednalli*
- cc.* Valve viii with more than two slits.
- d.* Tegmentum of valve viii pear-shaped, longer than wide; sides of valves pustulose, dorsal area defined, smooth; tufts subobsolete, *speciosus*
- dd.*—Tegmentum of valve viii irregularly rounded; pleural tracts of valves longitudinally costate, lateral areas granulated; dorsal areas delicately striate longitudinally . . . *Matthewsi*

Acanthochites (Loboplax) costatus Adams and Angus. *Man. of Conch.*, XV, p. 40, Pl. 3, fig. 74.

This species is distinguished by its strongly lobed head valve from all other known Australian *Acanthochites*. It is allied to *A. violaceus* of New Zealand and *A. tridacua* of New Caledonia. *A. costatus* has been collected by Angus at Watson's Bay, during an unusually low tide; also by Coppinger in Port Jackson. It has not been found there by Dr. Cox.

Acanthochites (Meturoplax) retrojectus⁵ Pilsbry. *Pl.* II, figs. 12, 13, 14, 15. *Nautilus*, vii, p. 107, January, 1894 (Preliminary description).

Shell small, narrow and elongated, convex, not carinated, black or black-brown, with a whitish "V" or three white stripes on each valve, sometimes broadly maculated with whitish at the sides, sometimes unicolored dark chestnut brown. Intermediate valves moderately beaked, convex behind (except valve ii, the posterior margin of which is straight), sculptured with comparatively coarse, rounded, scattered pustules, which become smaller and more crowded toward the middle, and are lower and less distinct on the ridge; no areas being distinctly differentiated on the valves. End valves similarly sculptured.

⁵ In allusion to the backward thrown mucro.

Posterior valve small, having the mucro obtuse and posterior, the posterior slope short, vertical.

Interior green, marked with black in the cavity. Head valve having the insertion-plate about one-third as long as the front slope of the tegmentum, with 5 small slits. Intermediate valves having very oblique plates with 1-1 minute posterior slits; posterior valve having the insertion plate short, and strongly directed forward, with a small slit on each side. Sutural laminae rather long and narrow, projecting far forward. Sinus wide, deep and square.

Girdle microscopically chaffy, with a series of hyaline spicules at the edge and 18 small and compact silvery tufts.

Length $9\frac{1}{2}$, width $3\frac{1}{2}$ mm. (dry specimen).

“ 12, “ 6 “ (average specimen preserved in alcohol).

Abundant in Port Jackson, near Sydney (Dr. J. C. Cox!).

This is a very distinct and easily recognized little species, of which Dr. Cox has collected great numbers. It varies interminably in the color and pattern of the valves, but not much in sculpture. The subgenus which I have constituted for the reception of this one species may be defined as follows:

Meturoplax, n. subg. of *Acanthochites*. Subg. Char.: Valves i to vii as in *Acanthochites*, but dorsal areas indistinctly differentiated; valve viii having the mucro posterior, the insertion-plate strongly directed forward, with one slit on each side, and no sinus behind. Girdle as in *Acanthochites*. Type *A. retrojectus*.

This group holds the same relation to *Acanthochites* that *Pallochiton* holds to *Chatoplenra*. It is a variation distinctly in the direction of the *Cryptoplacidae*, recalling *Choneplax*, and clearly showing the Acanthochitoid genesis of that family.

Acanthochites (*s. str.*) *asbestoides* Cpr. Pl. III, figs. 16, 17, 18, 19, 20.
Man. of Conch. XV, p. 17.

The prominent features of this species are (1), that the dorsal areas are hardly differentiated, being only somewhat smoother than the densely granulated latero-pleural areas, and totally lack longitudinal striation. (2) The posterior margins of the median valves are produced far backward in the middle, each strongly imbricating over the following valve, and inside the beak-margin is very broadly reflexed (fig. 16). (3) The tail valve is disproportionately small (compare fig. 20 with fig. 17) and its sutural-laminae are very long.

These features, in combination with the compact, asbest us-like sutural tufts, readily distinguish the species from other known forms.

A. asbestoides was collected by Coppinger at Port Molle, Queensland. It is also in the British Museum from Flinder's Island, Bass Strait. This last locality should be confirmed.

Acanthochites Coxi⁶ Pilsbry. Pl. III, figs. 21, 22, 23, 24, 25, 26; Pl. IV, fig. 34. Nautilus VII, p. 119, Feb. 1894 (preliminary description).

Shell elongated, the visible portion of the valves occupying less than one-third of the entire breadth of the animal (when preserved in alcohol). Valves grayish, somewhat mottled with olive and fleshy, the dorsal areas dark red or marked with olivaceous. Girdle olivaceous.

Exposed portions of the intermediate valves subtriangular, slightly elevated, hardly carinated, nearly separated at the sutures by spiculate bridges of the girdle. Dorsal areas wedge-shaped, convex, distinctly differentiated from the pleura but not elevated at the sides, sculptured with fine longitudinal striæ. Latero-pleural areas having the diagonal rib indicated by a low rounded convexity, and sculptured throughout with convex pustules elongated in a radial direction (fig. 21). Anterior valve having five low riblets indicated, each produced at the lower edge in a slight lobe. Posterior valve (Pl. III, figs. 22-25) having the tegmentum subcircular, a trifle wider than long, the mucro rather elevated and acute, behind the middle.

Interior rose colored. Anterior valve with the insertion-plate more than half as long as the front slope of tegmentum, pink, with five deep slits; intermediate valves having 1-1 slits, and a ridge running upward from the slits, as though the anterior edge of the posterior tooth projected over the posterior edge of the anterior tooth. Posterior valve having the insertion-plate subvertical behind, and slightly waved up between the two slits; its posterior contour convex. Sutural laminae large, rounded; sinus angular.

Girdle fleshy, densely clothed with short hyaline spiniclets, the tufts being represented by inconspicuous clumps of somewhat longer spines.

Gills three-fourths the length of the foot.

Length 23, breadth 13 mm. (alcoholic specimen).

⁶Named in honor of Dr. J. C. Cox, of Sydney, N. S. W.

Port Hacking, N. S. Wales (Dr. J. C. Cox).

This species differs from *A. granostriatus* in the inconspicuous tufts, obvious though low diagonal ribs, convex pustules, rounded contour of the insertion-plate of the tail valve, etc.

Acanthochites granostriatus Pilsbry. Pl. II, figs. 1, 2, 3, 4, 5, 6; Pl. IV, fig. 37.
Nautilus VII, p. 119. Feb. 1894.

Shell rather elongated. Exposed portion of valves occupying about one-third to one-half the total width (in dried specimens). Valves moderately elevated and obtusely keeled, the ridge indistinctly clouded with whitish, *orange* and blackish; sides mottled in indistinct and varying pattern with olive and white. Girdle olivaceous, tufts silvery stained with blue or dirty olive.

Intermediate valves having the exposed portions broadly wedge-shaped, truncated in front, decidedly imbricating. Dorsal area of each valve wedge-shaped, rather wide, convex, distinctly differentiated from the pleural areas, but not raised at the sides, sculptured with numerous rather weak longitudinal striae and crossed by slight growth-lines. Latero-pleural areas having no trace of a diagonal rib, sculptured with elongated, concave or flat pustules, arranged radially, and connected by opaque lines giving the appearance of radial striae. Anterior valve with very slight indications of three or five low rounded radial ribs. Posterior valve having the tegmen-
tum subcircular, the mucro rather acute and elevated, situated at the posterior third (Pl. II, figs. 2-5).

Interior of valves pink, becoming salmon colored posteriorly, stained with dark in the middle of the cavity, where there is a distinctly porous longitudinal band. Sinus moderately deep, squared and minutely crenulated. Posterior valve triangular, having an upward wave in the straight posterior margin, the postero-lateral margins concave.

Girdle clothed with short, greenish spicules and having eighteen conspicuous bluish or silvery tufts.

Length 9, breadth $3\frac{1}{2}$ mm. (dried specimen).

Length 10, breadth 7 mm. (alcoholic specimen).

Port Jackson and Port Hacking, N. S. Wales (Dr. J. C. Cox!).

Acanthochites Bednalli Pilsbry. Pl. II, figs. 7, 8, 9, 10, 11.

Shell oblong, moderately elevated, carinated, the side-slopes

straight. Color of valves light creamy-gray, sparsely maculated with dingy brown and white, usually showing some indistinct olive stains on some valves. Girdle gray, with conspicuous silky, silvery tufts.

The posterior (sutural) margins of the valves are nearly straight, the small beaks slightly projecting along the middle line. The tegmentum of each intermediate valve is divided into a distinct but not sharply defined triangular dorsal area, which is longitudinally marked by 15-20 *deeply cut striae*, and two subequilateral triangular side areas, which bear *concave* or flat topped ovate pustules, rather irregularly arranged. The anterior valve is similarly sculptured; and has several indistinct radial elevations; the front slope of its tegmentum is nearly double the length of the anterior teeth. The posterior valve has a rounded-hexagonal tegmentum which is somewhat broader than long, with the mucro between the posterior third and fourth of its length; behind the mucro sloping outward.

Interior tinged with rose in the middle and somewhat porous there, the teeth and sutural plates bluish or greenish; valve-callus strong; reflexed border of tegmentum very narrow. Anterior valve with five, intermediate valves 1-1 slits; posterior valve (Pl. II, figs. 8-10) having a distinctly biangular, bilobed contour behind; the posterior median portion straight, latero-posterior sides concave behind the two narrow slits. Sinus wide and angular in all the valves.

Girdle wide, densely clothed with short, gray-brown spicules, and having nine large tufts of long, silvery spicules on each side.

Length about 13, breadth $6\frac{1}{2}$ mm. (dried specimen).

Habitat: Western Shore of St. Vincent Gulf, S. Australia (W. T. Bednall).

This species is closely allied to *A. granostriatus*, but the valves are more solid; *the dorsal areas are much more deeply striated longitudinally*; that of valve viii is largely broken into granules. The sutural laminae in *A. bednalli* are greenish; the pustules of the side-areas are somewhat larger and rather less regularly arranged in longitudinal series. The profile of valve viii is not notably different in the two species, but the mucro of *A. granostriatus* is rather more posterior. *A. Bednalli* differs from *A. Cori* in having much more conspicuous and silky sutural tufts, in the color of the interior and sutural laminae, in the flat pustules, and in lacking the curved dia-

gonal rib which in *Coxi* extends from the apex of each median valve to its lateral slits.

Acanthochites (**Notoplax**) **speciosus** H. Ad. Pl. IV, figs. 31, 32, 33.
Man. of Conch., XV, p. 32, Pl. 1, figs. 23-26 (drawn from type).

This peculiar species may instantly be known by the wide, Cryptoplax-like girdle, densely clothed with minute spines which are thick and blunt for an *Acanthochites*, and having inconspicuous sutural tufts, not longer than the surrounding pile, but composed of finer, whiter spicules. The tegmentum of each intermediate valve is triangular, the girdle tissue forming spiculose bridges at the sutures. The dorsal areas are sharply defined, convex, and arcuately striated by growth-lines, but show no longitudinal striæ. The latero-pleural areas have round concave-topped pustules. Other notable features are found in the tail-valve, which is very high, with vertical posterior insertion-plate, and pear-shaped tegmentum. The sutural laminae and insertion-plates are radially striated, and the posterior valve has several slits, besides the usual pair. The tegmentum of the head-valve is small, extending hardly half the length of the front slope of the valve. The figures are drawn from a specimen from St. Vincent Gulf, furnished by Mr. W. T. Bednall. It has been known hitherto from Tasmania (Cuming coll.) and Flinder's Island (Jos. Milligan).

Acanthochites (**Notoplax?**) **Matthewsi** Bednall and Pilsbry. Pl. IV, figs. 27, 28, 29, 30.
Nautilus VII, p. 120, Feb. 1894.

Shell elongated, narrow, moderately elevated and carinated, the side-slopes straight. Valves of a delicate flesh tint, each having several concentric, forward-converging, zigzag bands of olive-brown. Girdle hoary, with white sutural pores.

Valves i to vii have the posterior (sutural) margins concave, the small beaks slightly projecting. Dorsal areas narrow, very convex, but not raised at the edges, delicately striated longitudinally. Side areas divided into pleural and lateral tracts by a small curved diagonal riblet; *the pleural tracts sculptured with longitudinal riblets* (about fifteen on each side), flattened and faintly crenulated; as they cross the diagonal rib these riblets bend abruptly upward, passing obliquely across the lateral areas, upon which they are more distinctly crenulated or broken into pustules, especially near the beak of each valve. Anterior valve having five low radial elevations,

pinnately corrugated, the lower margin of the tegmentum feebly angulated by them. Posterior valve having a large, irregularly rounded tegmentum, ribbed in front, granulated behind; *muero* at the posterior fourth of tegmentum, decurved and hooked, the slope behind it concave.

Interior white, with bluish macule at sinus and bases of the sutural laminae. Anterior valve with five, intermediate valves 1-1 slits; posterior valve having the posterior insertion-plate flaring backward and outward, with one strong slit on each side and several (two or three) between them. Sinus rather wide.

Girdle narrow, densely clothed with minute spicules, and having rather large bunches of very short white spicules at the sutures.

Length 26, breadth 8 mm. (dried specimen).

Habitat: South Australia (E. H. Matthews!)

The sculpture of this species is extremely peculiar, and totally different from that of any previously known member of the family *Acanthochitidae*. The coloring is also markedly distinct. The type was sent me by Mr. W. T. Bednall of Adelaide, South Australia, who suggested the specific name employed above. Although technically a *Notoplax* in its multifissate tail valve, this species is very unlike *A. speciosus*, the type of that group.

Acanthochites (*Notoplax*?) *variabilis*.

Hanleya variabilis H. Ad. and C. F. Ang., P. Z. S., 1864, p. 194; Angas, P. Z. S., 1865, p. 188.

Shell oblong, whitish, variegated with blackish-brown. Valves broad, carinated; dorsal areas longitudinally densely costate, the ribs closely pustulose; lateral areas but slightly elevated, transversely undulately costate, the costae closely pustulose. Girdle having short white corneous spicules at the margin, and bunches of pale spicules. Length 16, breadth 10 mm.

Habitat: Yorke Peninsula, under stones at low water (Angas).

The above translation of the original description is given for comparison with that of *A. Matthewsii*. This species is otherwise unknown to me, and may prove to belong to some other group. It is evidently distinct from *A. Matthewsii*, the proportions of breadth to length in the two being so different as to preclude the suspicion of identity which I at first entertained.

Family CRYPTOPLACIDÆ.

Genus CRYPTOPLAX Blainville.

Cryptoplax striatus Lamarek.

Abundant in Port Jackson.

The large series of admirably preserved specimens submitted by Dr. Cox shows conclusively the uncertainty and variability of the pore bunches. In some individuals they are all developed; in others most of them are certainly absent, the minutest scrutiny of the surface showing no trace of pores or their spicules.

Family CHITONIDÆ.

Genus CHITON Linné.

Chiton pelliserpentis Q. & G.

Port Jackson (Cox). I am quite unable to detect any difference between the excellent, fresh specimens sent by Dr. Cox and the New Zealand specimens from Auckland. This is the only species of the order known to me to be common to New Zealand and Australia.

Chiton muricatus A. Ad

The central areas have a ribless triangle in the middle; the pleura have about 10 narrow riblets on each side in front of the diagonal rib, but not extending forward to the anterior margin of the valve. The most prominent feature of this species is the peculiar sharp-pointed girdle scales, a character unique in this genus. This species was described from Sydney. Dr. Cox obtained specimens in Port Jackson showing great variation in color. Ángas found it at Port Lincoln.

Chiton jugosus Gld.

A beautiful species abundant in Port Jackson.

Chiton Coxi n. sp.

Shell oblong, strongly elevated, carinated, the side slopes straight, *Pleura longitudinally grooved in front of the diagonal, the surface elsewhere smooth.* Color delicate bluish, mottled or blotched with olive-brown, yellow and white. Girdle a delicate blue-green, with narrow white bars.

Intermediate valves moderately beaked; *lateral areas smooth and well raised*; central areas having a large smooth triangle in the

middle; the *pleura sculptured with deep narrow grooves*, separated by intervals about double their width, and *extending but a short distance forward from the diagonal line*, except that the outer three or four grooves extend to the anterior edge of the tegmentum. About 9 or 10 grooves may be counted on each side of a valve. Anterior valve much larger than the posterior, unsculptured. Posterior valve having the *micro acute*, about central, distinctly projecting; the posterior slope concave.

Interior bluish or creamy white; sinns notched at the sides, delicately denticulate. Anterior valve having 8, intermediate valves 1-1, posterior valve 12 slits; teeth pectinated outside and on the edge.

Girdle rather wide, densely clothed with imbricating, convex, shining scales which are densely and most minutely striated, have the usual low rounded outlines, and measure in breadth .30 mm.

Length 13, breadth $7\frac{1}{2}$ mm.; divergence 90° to 110° .

Port Jackson (Dr. J. C. Cox).

This is probably the *Lophyrus jugosus* of Angas, P. Z. S., 1867, p. 222.

It is allied to *C. jugosus* Gld. but differs totally in color-pattern. The girdle scales are smaller than in a specimen of *jugosus* of the same size; the grooves in front of the diagonal line are narrower, with wider interspaces, etc.

Genus LORICELLA Pilsbry.

This name was proposed originally as a section of *Lorica*. At that time I had seen no specimens of *L. Angasi*, its type. Several alcoholic examples are now before me, showing features not before noticed, which are undoubtedly of generic importance. The group may be characterized as follows:

Gen. char.: Valves entirely exposed, the front one very large, having numerous unequal, conspicuously pectinated teeth; median valves squared, having a narrow bi-lobed sinus, slits 1-1; posterior valve small, with posterior *micro*, the insertion-plate reduced to a low ridge, nearly smooth and interrupted by a slight sinus behind. Girdle widest in front, having a small slit behind; densely covered with minute elongated granules and bearing long, branching bristles arranged in radial series.

In short, *Loricella* has the general features of *Lorica*, plus girdle

hairs, and with the girdle and tail-valve shaped like those of *Pluviphorella*.

The hairs of the girdle branch, somewhat as in *Mopalia ciliata*. There is no trace of eyes or eye-pits upon the valves; but the genus has doubtless descended from a form having eyes, and its position in the general system will not differ from that assigned in my monograph of the Polyplacophora.

Loricella Angasi Ad.

Port Jackson, several specimens collected by Dr. Cox. It occurs also in South Australia. The largest specimen I have seen is one sent by Mr. Bednall of Adelaide.

The presence of hairs upon a girdle with a dense covering of scales is an extremely rare if not unparalleled combination of characters.

Genus LILOPHURA Pilsbry.

Liolophura Gaimardi Blainv.

1825.—*Chiton Gaimardi* Bly., Dict. Sc. Nat., xxxvi, p. 546.

1846.—*Chiton incanus* Gld., Proc. Bost. Soc. N. H., ii, p. 145.

1867.—*Chiton piccus* Angas, P. Z. S., 1867, p. 223. Not of Gmel.

1874.—*Chiton piccus* Tap. Can., Viag. 'Magenta,' p. 77.

1893.—*Liolophura Gaimardi* Pils., Man. of Conch., xiv, p. 240.

Collected abundantly at Port Jackson and Port Hacking by Dr. Cox. This species has been confused by writers with *Acanthopleura*. The latter genus is found in Australia only along the coast of tropical Queensland.

Three species of the genus *Liolophura* are now known from Australia: *L. Gaimardi*, inhabiting the coast of New South Wales, with a variety in Queensland; *L. georgiana* Q. and G., described from King George Sound, S. W. Australia, and *L. curtisiana* Smith, from Port Curtis, Queensland. I have not seen the last-named species.

L. Gaimardi queenslandica n. var.

Valves similar in form and coloring to those of *L. Gaimardi*; girdle covered with black spines, which are somewhat more slender than in *Gaimardi*. Length 50, breadth 31 mm. (dry specimen).

Larger than any of the typical form seen, and distinguished by the uniform black color of the girdle. Type is No. 64,853 of the

Academy collection, taken by Dr. Cox at Bundaburg, Queensland.

Genus **ONITHOCHITON** Gray.

Two species or at least forms of this genus are represented in the collections made by Dr. Cox at Port Jackson and Port Hacking. The relations of *O. Lyellii* Sowb., *quercinus* Gld. and *rugulosus* Ang. are peculiarly perplexing, and more material than is before me is required for a satisfactory revision of the group.

O. rugulosus Angus.

Port Jackson and Port Hacking, (Cox!). In this form the lateral areas are transversely rugose, and the pleura have fine, close irregular riblets, converging toward the ridge.

O. quercinus Gould.

Port Jackson (Cox!).

I take this to be the form having the central areas nearly smooth, with some riblets toward the outer edges of the pleura. Probably intergrades with the preceding.

EXPLANATION OF PLATES.

PLATE II.

FIGS. 1 to 6. *Acanthochites granostriatus* Pilsbry.

FIG. 1. Dorsal view of valve vii.

FIG. 2. Dorsal view of valve viii, sutural laminae broken.

FIG. 3. Ventral view of valve viii, sutural laminae broken.

FIG. 4. Posterior view of valve viii.

FIG. 5. Lateral view (profile) of valve viii.

FIG. 6. Sculpture of the middle of side area of an intermediate valve, x 22.

FIGS. 7 to 11. *Acanthochites Bednalli* Pilsbry.

FIG. 7. Dorsal view of valve vii.

FIG. 8. Dorsal view of valve viii.

FIG. 9. Posterior view of valve viii.

FIG. 10. Lateral view of valve viii.

FIG. 11. Sculpture of side area, x 22.

FIGS. 12 to 15. *Acanthochites retrojectus* Pilsbry.

FIG. 12. Dorsal view of an intermediate valve.